

## Case Report

### Clip Migration Within 15 Days of 11-Gauge Vacuum-Assisted Stereotactic Breast Biopsy

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**A**fter a percutaneous vacuum-assisted breast biopsy, a metallic clip is frequently placed at the biopsy site by interventional breast radiologists [1, 2]. The clip acts as a landmark for future reference when the mammographic abnormality (mass or calcifications) is removed during stereotactic biopsy. If histology is benign, the clip denotes the site of biopsy on future mammograms. If atypical or malignant histology is found at the core biopsy, the clip helps to identify and localize the area as needed for future surgery. With neoadjuvant therapy, a malignant area can become progressively and mammographically imperceptible, with the clip remaining as the only mammographic evidence of the initial site of the malignancy.

Initial clip misplacement at the time of stereotactic breast biopsy is known to occur [3] and is typically identified immediately after the procedure. Three reports of migration of the Micro-Mark clip (Ethicon Endo-Surgery) within 5 weeks [4], 10 months [5], and 1 year [6] of accurate initial placement have been reported. Two cases of migration of the Gel Mark clip (SenoRx) within 8 days [7] and 10 weeks [4] of initial accurate placement have been reported [6]. To my knowledge, I am reporting the first case of Gel Mark clip migration, which occurred within 15 days of initial accurate placement that was confirmed by mammographic imaging, that

led to inaccurate preoperative needle localization, using digital stereotactic guidance.

Consultation with the institutional review board revealed neither their approval nor informed patient consent was required for this case report.

#### Case Report

A 60-year-old woman with no family or personal history of breast cancer and a previous benign stereotactic breast biopsy in the right breast underwent percutaneous stereotactic-guided biopsy for indeterminate calcifications at the 11-o'clock position of the right breast. The right breast biopsy was done in a cranial to caudal approach with an 11-gauge vacuum-assisted biopsy device (Mammotome, Biopsys/Ethicon Endo-Surgery). No significant bleeding occurred during or immediately after the biopsy. A metallic Gel Mark clip was deployed into the biopsy cavity because of removal of the bulk of the calcifications during biopsy. This biopsy site marker system consists of an introducer containing seven dehydrated gelatin foam pledges, the fourth of which contains a stainless steel clip. The introducer system is placed into the biopsy probe and the foam pledges are deployed into the biopsy cavity in a slow and steady manner. The gelatin foam pledges are ultimately resorbed, with the clip left behind.

Postprocedural craniocaudal images followed by mediolateral oblique mammographic images (Fig. 1) confirmed removal of calcifications on biopsy with accurate initial clip placement at the biopsy site. An air-filled cavity and minimal hematoma changes were present after biopsy. Histology showed atypical ductal hyperplasia associated with microcalcifications in the core biopsy specimens. The patient was contacted 1 day after biopsy and reported no pain, bleeding, or swelling at the biopsy site. She was informed of the histologic results and surgical excision after preoperative needle localization was recommended.

The patient returned 15 days after initial stereotactic biopsy for surgical excisional biopsy. Preoperative needle localization was done with digital stereotactic guidance with a modified disposable Kopans spring hook localization needle (Cook), using the same craniocaudal approach. The skin-entry site of the localizing needle was close to the scar from recent stereotactic breast biopsy. Post-procedural craniocaudal and true lateral mammographic images (Fig. 2) confirmed successful placement of the reinforced segment of the wire in close approximation to the clip. However, the clip had migrated 8 cm inferiorly, 1 cm laterally, and 1 cm posteriorly with respect to the initial biopsy site. The mammographic images, clip migration, and

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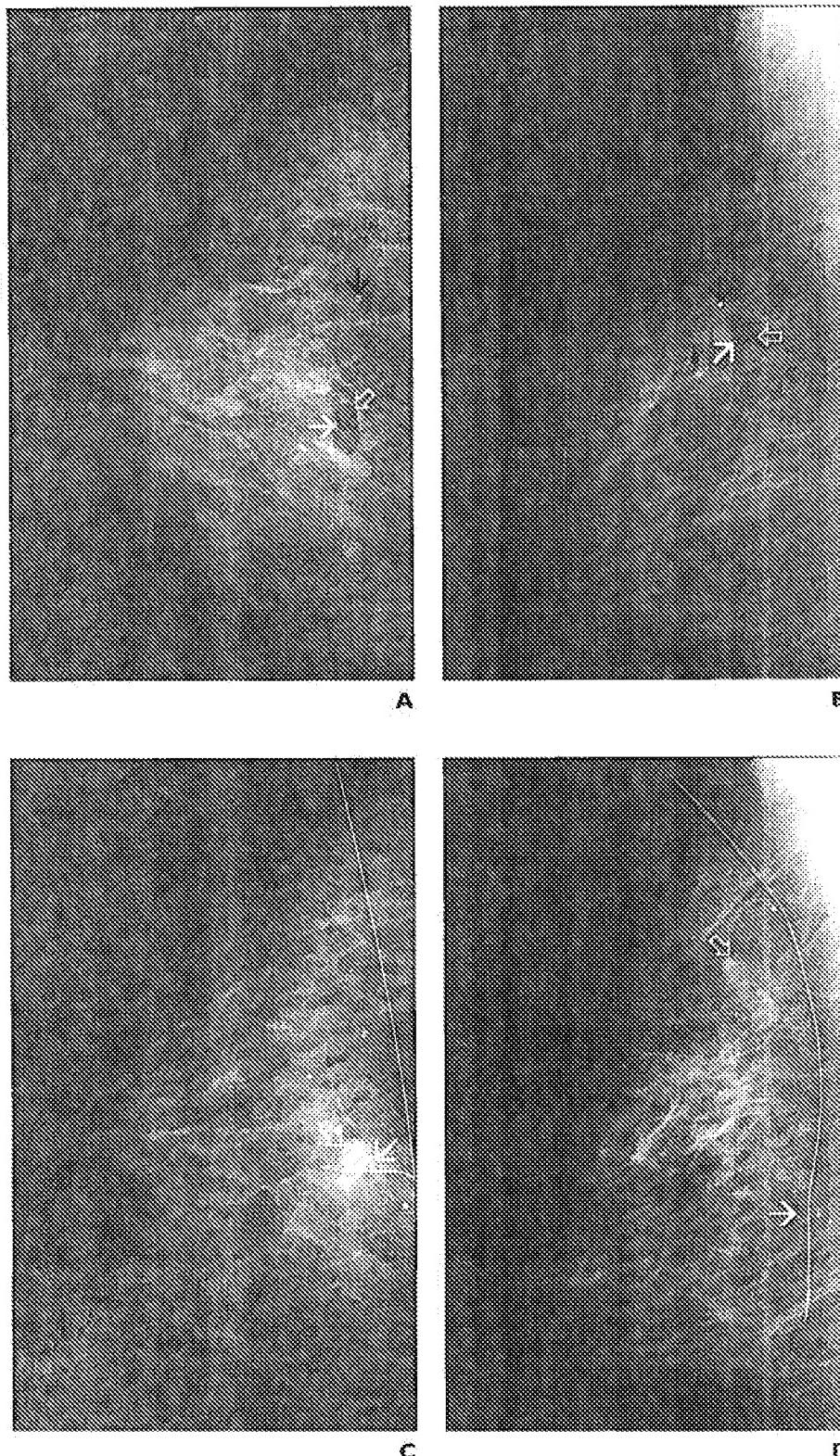
wire placement were all immediately discussed with the patient and breast surgeon.

After informed consent was obtained, the biopsy site was successfully localized stereotactically using a craniocaudal approach with

a second modified disposable Kopans spring hook localization needle. Postprocedural craniocaudal and true lateral mammographic images (Fig. 3) confirmed successful placement of the reinforced segment of this second

wire in close approximation to the hematoma at the biopsy site.

At surgery, the errant wire localizing the migrated clip was removed by the surgeon. A specimen containing the correctly placed



**Fig. 1**—A 60-year-old woman with no family or personal history of breast cancer and a previous benign stereotactic breast biopsy in the right breast underwent percutaneous stereotactic-guided biopsy for indeterminate calcifications at the 11 o'clock position of the right breast.

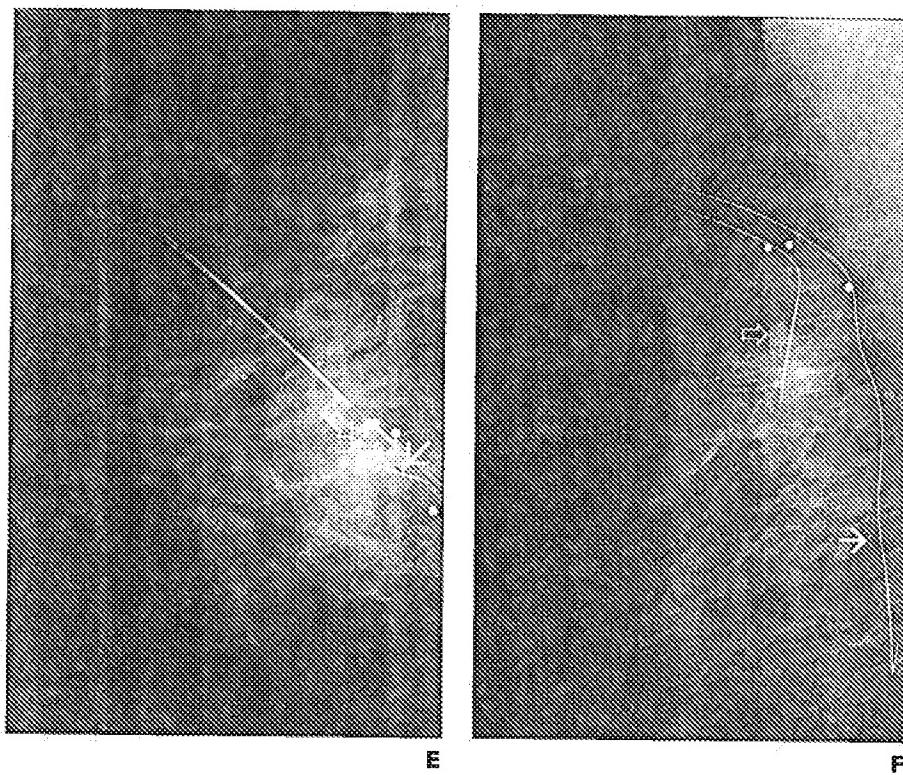
**A** and **B**, Immediate postbiopsy craniocaudal (**A**) and true lateral (**B**) mammograms show the Gel Mark clip (SenoRx) (white arrow) to be within biopsy site, as denoted by air-filled cavity (hollow white arrow). MicroMark clip (Ethicon Endo-Surgery) from remote stereotactic biopsy (black arrow) is noted.

**C** and **D**, Initial preoperative needle localization craniocaudal (**C**) and 90-degree lateral (**D**) mammograms show Gel Mark clip (Seno Rx) (arrow) to be inferiorly, laterally, and posteriorly displaced with respect to biopsy site, where there is minimal hematoma (hollow arrow). Initial hookwire placed under stereotactic guidance is shown in close approximation to clip, with skin-entry site denoted by round metallic BB placed on breast. (Fig. 1 continues on next page)

## Clip Migration After Breast Biopsy

**Fig. 1. (continued)**—A 60-year-old woman with no family or personal history of breast cancer and a previous benign stereotactic breast biopsy in the right breast underwent percutaneous stereotactic-guided biopsy for indeterminate calcifications at the 11 o'clock position of the right breast.

E and F, Final preoperative needle localization craniocaudal (E) and mediolateral oblique (F) mammograms again confirm Gel Mark clip (Seno Rx) (arrow) to be inferiorly, laterally, and posteriorly displaced with respect to biopsy site, where there is minimal hematoma (hollow arrow). Second hookwire placed under stereotactic guidance is through biopsy site, with skin-entry site denoted by two round metallic BBs placed on breast.



wire containing the biopsy site was surgically excised. Histologically, the surgical biopsy specimen showed fibrosis, fat necrosis, hemorrhage, and chronic inflammation consistent with the previous biopsy site. No residual foci of atypical ductal hyperplasia were seen in the specimen, and microcalcifications were associated with benign adenosis. No intraductal or infiltrating malignancy was identified. The postoperative course was uneventful.

### Discussion

Tissue marker clip placement after percutaneous stereotactic breast biopsy is often used by interventional breast radiologists [1, 2]. If a lesion becomes mammographically obscured or absent immediately after percutaneous stereotactic breast biopsy, a clip is commonly introduced through the biopsy needle into the biopsy cavity to help enable future localization if core biopsy histology shows malignancy or high-risk lesions. A clip may represent the only mammographic evidence of the initial biopsy site after neoadjuvant therapy. Clip malposition is becoming increasingly recognized as a complication after percutaneous stereotactic breast biopsy. This may be from initial misplacement of the clip at the time of the biopsy or from delayed migration.

Initial clip misplacement at the time of stereotactic breast biopsy is usually identified immediately after the procedure. This initial clip misplacement typically ranges from a few millimeters to centimeters for the MicroMark clip and is largely attributed to the accordion effect along the z-axis during decompression of the breast after stereotactic biopsy [3]. Thus, initial clip misplacement is along the same axis as the needle trajectory. One letter [8] describes clip extrusion through the skin-entry site after stereotactic breast biopsy.

Delayed migration refers to shift of the marker location after initial correct placement of the marker into the biopsy cavity. Three reports of delayed migration of the MicroMark clip within 5 weeks [4], 10 months [5], and 1 year [6] of accurate initial placement have been reported. Two cases of migration of the Gel Mark clip within 8 days [7] and 10 weeks [4] of initial accurate placement have been recently reported. This article reports a third such migration of this clip that occurred within 15 days of initial accurate placement confirmed by mammographic imaging. To my knowledge, this is the first such migration that led to inaccurate preoperative needle localization.

The two previous reports of delayed migration of the Gel Mark clip have been along the axis of the insertion of the biopsy needle (i.e.,

the z-axis). This has been postulated to occur from the accordion effect. Initially at biopsy, the clip is within the biopsy cavity but does not adhere firmly to the breast tissue. When the breast is released from compression after stereotactic biopsy, movement of the clip from the biopsy site occurs along the trajectory of the biopsy needle, presumably the axis of least resistance.

The mechanism of delayed migration of the Gel Mark clip in the presented case is more complex. The migration of the Gel Mark clip in this patient was shown by mammography to be 8 cm inferiorly, 1 cm laterally, and 1 cm posteriorly. This movement in three dimensions ( $x$ ,  $y$ ,  $z$ ) cannot be solely replaced by the accordion effect, which occurs along the z-axis. Some of this shift may be due to pliability of the breast and technical factors, such as slightly different angles of compression of the same projection during different mammograms. Minimal hematoma changes were noted at the stereotactic biopsy site on the immediate postbiopsy and preoperative mammogram images. Bleeding during or after the procedure may have contributed to shift of the clip. In addition, asymmetric resorption of the gelatin foam pledges may have contributed to clip deviation.

In this case, delayed clip migration within 15 days of initial placement of the Gel Mark clip led to inaccurate initial preoperative stereotactic-guided needle localization. Based on this experience, as Philpotts et al. [6] recommend, I strongly recommend that repeat cranio-caudal and lateral mammograms be obtained on the day of the needle localization before the procedure. This should be done irrespective of how soon after the biopsy the needle localization is scheduled. Unanticipated delayed clip migration can otherwise lead to inaccurate preoperative needle localization, dramatically affecting patient care.

Other methods can also be used to help assure accurate preoperative needle localization, even if there is delayed migration. If one is using digital stereotactic guidance with the same approach and equipment as the original stereotactic biopsy, the z-axis depth of the clip on the day of the localization can be compared with the z-axis depth of the lesion on the date of biopsy to determine significant z-axis

migration. If mammographic-guided localization is done, the orthogonal view to the initial approach of biopsy enables comparison of the depths of the localizing needle, the clip, and the location of the lesion on the prebiopsy views. If sonogram guidance is used, the post-biopsy hematoma can be localized.

To summarize, a 60-year-old woman underwent 11-gauge vacuum-assisted stereotactic biopsy of a cluster of indeterminate calcifications in the right breast. Initial clip placement was confirmed by mammography to be at the biopsy site. The clip was localized for surgery stereotactically 15 days later, which confirmed interval migration of the clip in three dimensions. The delayed clip migration led to inaccurate preoperative needle localization. Based on this experience, radiologists are recommended to obtain orthogonal mammogram on the day of needle localization before wire placement, irrespective of the time interval after initial stereotactic-guided clip placement.

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